GROUND ACCESS TO LOGAN AIRPORT:

AN ANALYSIS OF TWO OPERATIONAL RESPONSES

by

Claire Grossman
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ABSTRACT

This paper explores the nature and scope of the ground access problem to Logan Airport. While Logan itself has been able to keep pace with its growth, ground access improvements have not. Existing conditions are severely congested, and forecasts project a rate of growth likely to result in even more unacceptable levels of congestion in the next ten years. For a long while attention focused on a construction solution that now seems highly unlikely. A key question, then, is how much can be accomplished by innovative schemes for utilizing the existing highway infrastructure?

This paper analyzes two short-term operational repsonses to ground access in Boston. The history of increased limo/bus usage and one-way tolls suggest that a myriad of political issues must be addressed to increase the likelihood of implementing such technically feasible operational responses. Evaluation of the success or failure to implement these measures offer insights into the way in which policy makers deal with urban transportation problems and the nature of the political process itself.

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Chapter 1

For many years Logan Airport has viewed many of its most pressing problems - including noise, landfill operations, acquisition of property and other activities intended to accomodate growth in air traffic as "capable of resolution." While Logan has been able to keep pace with its growth, ground access improvements have not. This paper will address the nature and scope of the ground access "problem." For a long while attention focused on a construction solution that now seems unlikely. Thus, the key question is how much can be accomplished by innovative schemes for utilizing the existing infrastructure. This paper analyzes two short-term operational responses to ground access traffic congestion in Boston. Evaluation of increased limo/bus usage and one-way tolls offer insights into the way policy makers deal with urban transportation problems and the nature of the political process itself.

Much of the information for this paper comes from interviews, although specific people are only occasionally mentioned in the text. Names are not included for the following reasons: (1) the general information was received from several persons, (2) the interviewee requested to remain anonymous, or (3) the author deemed it unnecessary to the content.

Logan Airport access is unusually constrained because the airport is separated from most of the City of Boston and its

suburbs by Boston Harbor, and the Harbor must be crossed in one way or another by the large majority of air travelers (see Appendix I for map of the area). Approximately 82 percent of the passengers reaching Logan by ground mode use the heavily congested Sumner and Callahan Tunnels under Boston Harbor. Route 1A ramps extend from the East Boston end of the tunnels and connect to the Airport access/egress roads. An alternative approach to the airport is over the Mystic-Tobin Bridge, the only other harbor crossing. Access, however, between the bridge and the airport is over local streets. Because of this, and because the tunnel route is much more direct, almost all air passengers use the Sumner and Callahan Tunnels. Although the Bridge does provide an important alternative for non-airport traffic crossing the harbor, it is also heavily congested. A third harbor crossing south of the tunnels has been considered.

After almost two decades of debate, it now seems that the likelihood of a third harbor crossing being built in the 20th century is small. In 1972, for example, the Boston Transportation Planning Review (BTPR), a cooperative planning effort by Massachusetts public agencies, proposed a special purpose tunnel, but the Dukakis Administration (1974-78) opposed any tunnel construction as did Speaker of the House Tip O'Neal and Senator Edward Kennedy. Ed King, Massachusetts Governor from 1978-82, and a strong supporter of the project, authorized an Environmental Impact Statement (EIS) to study options for construction. Just as the EIS was

completed in December 1982, Dukakis returned to office.

Recently Secretary of Transportation Frederick P. Salvucci has proposed that other options be studied including the depression of the Central Artery. (The Central Artery feeds the Sumner and Callahan Tunnels on the Boston end; it is a 2 mile section of a long highway, I-93, with closely spaced access/egress ramps, narrow lanes and steep grades.) EIS studies must be finished by September 1983 for any project to qualify for federal financing. Such financing is a necessity as it would cover 90 percent of the project's costs.

Adequacy of the ground access system is viewed differently by various groups. Often airport access problems are defined in terms of the air passenger. However, there are other people in addition to air travelers who see the system as inadequate. These include, most notably, people using the tunnels for non-airport trips. In addition, numerous professional airport planners and traffic engineers view it as one of the state's most pressing transportation issues. On the other side of the debate are people who feel that the air passenger does not always need to be catered to. They argue that access can be improved but large expenditures for such improvements may not be the appropriate use of scarce financial resources. Finally, people who do not live near the tunnels or use them frequently are not likely to see it as a serious issue.

Logan ground access congestion represents different costs and benefits to different parties. There are, in general, three different perspectives. Air travelers seek to reach Logan quickly and reliably with maximum convenience and an attractive trip, although cost is also a consideration.

Massport, the airport operator, is interested in Logan's continued growth and the smooth running of its operations. Logan has long been the chief source of Massport's revenues. Although Logan dominates air travel in the area, it is in Massport's best interest not to have Logan become associated with being a "hassle."

Several other groups which may be interested in growth include: the Boston area business community and those employees of downtown hotels and restaurants who depend indirectly on Logan to attract tourists for business. The City of Boston and the Commonwealth may begin to take a more active interest in the effects of ground access congestion on the local economy in the years to come.

Residents of the neighborhoods adjacent to Logan are the main opponents of ground access improvements and of Logan growth generally. When asked what particular problems at Logan upset the local area, one local official replied, "It's Logan, period." "We can't build more homes in East Boston, but it's OK for Logan to keep getting bigger," stated another referring to East Boston residents as "victims" The problems range from expansion of facilities to noise to construction disruption. Traffic is just one more negative factor

resulting from the preceived intrusion of Logan on the daily lives of East Boston residents. Logan-bound truck traffic on local streets is a problem just as the sheer volume of cars and the abundance of parking lots remind people of Logan's proximity. Although air quality and safety may not be their first complaints, they are negative consequences which the immediate areas experience most intensely.

Taxpayer groups, finally, tend to be sensitive to the costs involved in projects to ease congestion. Some taxpayers doubtless see congestion as a problem but one to be addressed only by inexpensive means.

Regardless of one's perspective, most would agree that the close proximity of Logan to downtown is a valuable resource to the region. Some firms, such as the Sheraton Corporation, located their headquarters in Boston specifically because of the close location of the CBD to Logan. According to a Boston Globe report at the time, Sheraton would not have invested in Boston otherwise.[1]

Congestion can be expressed quantitatively by several methods reflecting the degree of adequacy of a facility. Two measures referred to in this paper are level of service (LOS) and road capacity. LOS is an abstract measure encompassing speed, throughput and volume in relation to the capacity of the access system. The six levels represented by the letters A through F, range from free-flow to jammed conditions. LOS A-D are acceptable operating conditions in an urban context.[2] (For a pictoral representation of LOS see Appendix II.)

Capacity is the physical ability of a system to handle a given volume of traffic.

The percentage of cross harbor traffic that is Logan-bound continues to increase every year. It was 40 percent in 1972 and is estimated to be between 53 and 57 percent at present.[3] This increase is a reflection of increased activity at the airport and relatively static local travel volumes.

Logan Enplanements (rounded to the nearest million)[4]

1960 - 2.8 mil.
1965 - 5.5 mil.
1970 - 9.4 mil.
1975 - 10.5 mil.
1980 - 14.7 mil.

The total two-way capacity (maximum achievable hourly flow) of the Sumner and Callahan Tunnels and the Tobin Bridge is estimated at 117,000 vehicles per day. The maximum achievable hourly flow of both the Callahan and Sumner Tunnels is roughly 1600-1630 vehicle/hour/lane, or 3200-3260 vehicle/hour per direction.[5] The maximum possible volume is apparently achieved with significantly greater regularity and frequency in the Sumner Tunnel than in the Callahan, even though the Callahan peak periods are of longer duration on the average. According to Brian Day (traffic consultant to Massport), "a major direct cause of the Callahan's 'sub-capacity' performance is the speed variances that exist between vehicles at the tunnel entrance, between tunnel lanes, and between adjacent sections of the traffic."[6] Speed variances at the tunnel entrance have been due to bottlenecks

in the Callahan tunnel where 8 lanes merged into 2 in about 200 feet. The Sumner bottleneck is worst at its exit. The volume is established by operating speed.

Some studies focus on the "daily throughput potential" of the existing highway facilities. If one estimates daily capacity as 17 times hourly capacity, 52,700 one-way vehicle trips per day can be accommodated in the tunnels.[7] This analysis is relevant to Logan users as they constitute such a high percentage of all tunnel traffic. The practical utility of the tunnel, however, is governed less by its daily capacity than by its capacity during the peak hours of air-line trip demand. The fact that the peaks in airport traffic coincide with the daily metropolitan work-trip peaks only makes the problem worse. In other words, most of Boston is moving at the same time.

There are differences in the flow of traffic in the two tunnels during the morning peak. The Callahan Tunnel experiences little congestion during morning peaks (with the exception of Monday, a commuting friend tells me). The majority of morning traffic operates at speeds of about 30 m.p.h. and elapsed times through the tunnel average 2 minutes.[8] In contrast, the Sumner Tunnel experiences severe congestion during the morning peak; LOS is F. Toll booths are located at the entrance to the Sumner Tunnel, while they are at the end of the Callahan Tunnel. While an adequate number of toll booths exist to serve current demand volume in the Sumner Tunnel, the entrance is severely congested because

of the constricted merge from 7 toll-booth lanes into two lanes within only a 200-foot distance. Bottlenecks exist at the tunnel egress on the Boston side because of pedestrian crossings and local traffic. Queues which originate on the Boston end of the tunnel extend through the entire tunnel and onto Route 1A as far back as the Airport Road interchange (approximately 1/2 miles).[9]

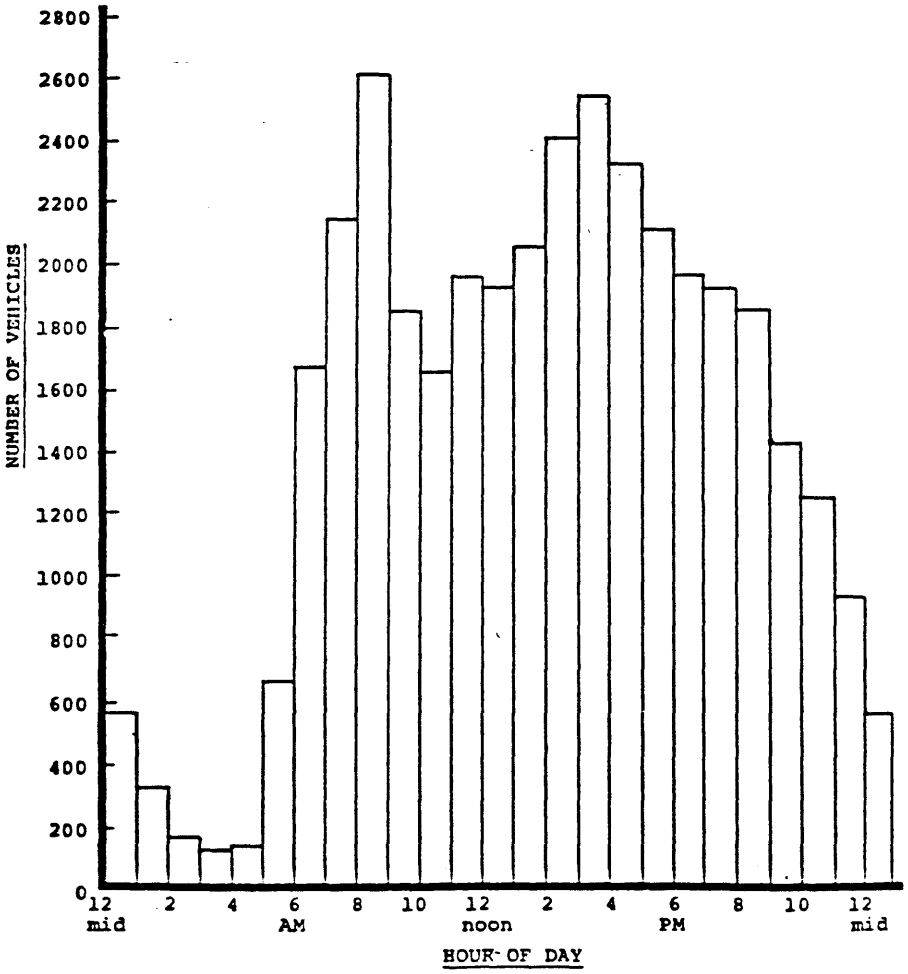
In the evening peak, LOS F operations exist in both tunnels. As in the morning peak, local street traffic and pedestrians create back-ups so Callahan Tunnel traffic experiences long queues and delays at the Boston entrance. The bottleneck from the merging lanes in the Callahan entrance is made worse by the queues on the Central Artery and the other feeder streets to the tunnel.[10] The chart on the next page illustrates the total inbound traffic to Logan by time of day.[11]

Tunnel volumes are a direct reflection of mode choice. If a privately owned car is available, it generally is used unless it is very inconvenient or another mode is easily accessible. "Driving to the airport is part of American culture," commented Cathy Donaher, former Massport Planning Director. The following is 1982 data on daily person vehicle trips by mode for air passengers arriving at Logan by ground transportation:[12]

TOTAL VEHICLES INBOUND TO LOGAN

By Time of Day

(ADT)



Mode	Air Passenger Person-Trips	% Person-Trips	Vehicle Trips	% Vehicle Trips
MBTA	1,096	6.3	None	0.0
Other Bus	581	3.3	60	0.3
Taxi	3,422	19.6	4,655	22.8
Limo	893	5.1	251	1.3
Rental	1,965	11.3	1,638	8.0
Private Car	9,492	54.4	13,829	67.7
TOTAL	17,449	100.0	20,433	100.1

(Note: Because of drop-offs, there are often two vehicle trips for one air-passenger person trip. Massport ignores transit vehicle trips in its vehicle counts because few transit vehicles utilize the harbor crossings. Transit buses and vans are numerous on Logan's circulation roads, however, mainly circulating from the rapid transit station, rental car companies, etc.)

In total, the 17,449 inbound air passengers generate 20,433 vehicular trips, or 1.2 vehicle trips per inbound passenger per day.[13] The percentages here have been somewhat constant over the years paralleling Logan's growth. In 1970, 29.4 million passenger trips were made to Logan, and the mode split was:[14]

84.2% private and rental car
6.2% transit
7.5% taxi and limo
2.1% other

In 1982, a total of 67.7 percent of vehicle trips were in private cars. Increased taxi ridership, from 7.5 percent (with limos) to 22.8 percent (for taxis only) in 1982, accounts for some of the decrease in use of private cars.[15]

Logan also employs about 12,000 people, of whom up to 9,000 work on any single weekday. These 9,000 employees generate 18,000 trips going to and from Logan at the start and end of work and, according to a Cambridge Systematics

study, they make an additional 8,000 trips during work hours. These 26,000 daily employee trips represent about one-fourth of all airport ground traffic and one third of airport-bound private vehicle traffic.[16]

Since employers provide free parking (often guaranteed by union contract), there is little incentive for employees not to drive. Massport efforts to encourage car pools have been unsuccessful. Employee hours are, fortunately, more staggered than at most other employment sites. The Cambridge Systematics survey revealed that about half of all employees start work between 6 am and 9 am and end between 2:30 pm and 6 pm.[17]

Following are Massport's estimates of Logan employee access modes as of 1982:[18]

Mode	Adjusted Freq. (%)	Adjusted Person-Trips
Auto driver	81.3	9,592
Auto passenger	6.8	805
MBTA, Massport Bus	8.3	977
Walk	0.4	47
Taxi	0.3	35
Motorcycle	1.0	118
Other	1.7	200
	99.8	11,774

Finally, a brief overview of the parking situation:[19]

Public Garage Parking

Capacity	8,700 spaces (public)
Peak Occupancy (average day)	5,500 vehicles
Peak Occupancy (average Wed./Thurs.)	7,000 vehicles
Peak Occupancy (Wed/Thurs. in Aug.)	8,400 vehicles
Overnight Occupancy	3,900 vehicles

Saturation of parking cpacity at Logan is a growing problem. Last year Logan lots overflowed only a few times whereas this year it occurred 5 times during just a two week period in April. Massport is currently considering strategies to address the situation.

Air traveler parking demand seems to be highly inelastic as a function of price. Any elasticity between --1 and 0 implies that the total revenues will increase when price increases. The gain in revenue will be greater when price is increased to hold demand constant than if additional spaces are made available to accomodate all demand at unaltered prices. The Logan price elasticity of demand is extremely low (-.12 to -.13).[20] Recent rate increases have not affected short-term parkers, but they have encouraged long-term parkers to use alternative off-airport park n'fly facilities. Massport, it seems, has relatively little leverage to control total demand for parking.

Compared to airports in most major American cities, Logan is very close to the CBD, as indicated by the following:[21]

Airport	Distance from CBD
1. Seattle - Sea Pac	20
2. Dallas - Fort Worth	19
3. Chicago - O'Hare	19
4. Las Vegas - MacCarren	16
5. San Francisco International	15
6. Los Angeles International	13
7. Atlanta - Hartsfield	9
8. Miami International	7
9. Boston - Logan	3
	Avg: 15 miles (not including Logan)

By their location, airports distant from their CBD's can be said to impose significant access costs on air travelers. In Logan's case, access costs are becoming very high despite the proximity because peak demands strain both the immediate airport roads and the entire transportation subsystem of the Boston central area. The questions that keep recurring are: to what extent are people willing to tolerate the severe congestion access to Logan and what "price" are they willing to pay to improve it?

Footnotes: Chapter 1

1. Discussion with Bruce Campbell. Transportation Research Forum, Cambridge: April 28, 1982.

2. Capacity estimates are likely to be based upon: (1) a determined level of service, and (2) peaking characteristics. Thus, it is possible to exceed the established level of capacity as a result of the peak spreading.

3. Coverdale and Colpitts, "Report on Logan Airport Travel Study" (New York: 1972), p. 11; Cambridge Systematics, Inc., "Logan Airport Master Plan Study Ground Traffic and Transportation" (Cambridge: April 10, 1980), p. 18.

4. Discussion with Karen Waite, Aviation Department, Massport, May 12, 1983.

5. Brian Day, "Reports on the Effects and Feasibility of a One-Way Toll Collection Policy at the Mystic-Tobin Bridge and the Sumner-Callahan Tunnels" (Massport: June 1982), p. 26.

6. Ibid., p. 26.

7. An example where this is mentioned is in Jeff McMann's Memo (Cambridge Systematics, Inc.: June 17, 1980).

8. Draft "Environment Impact Statement (EIS), Third Harbor Project, Interstate 90" (Boston, Dec. 1982), p. 30.

9. Ibid., p. 30.

10. Ibid., p. 30.

11. Cambridge Systematics, Inc., "Logan Airport Massport Plan Study Ground Traffic and Transportation" (Cambridge: April 10, 1980), p. 19.

12. Cathy Buckley, "Ground Traffic Generated by Logan Activities" (Central Transportation Planning Staff - CTPS Memo: May 5, 1982), p. 5.

13. Ibid., p. 5.

14. Boston Transportation Planning Review, Harbor Crossing (Boston: 1972), p. 35.

15. Cathy Buckley: May 5, 1982, p. 5.

16. Cambridge Systematics, Inc., "Logan Airport Employee Survey Report" (Cambridge: Jan. 1980), p. 1.

17. Ibid., p. 8.

18. Cathy Buckley: May 5, 1982, p. 7.

19. Cambridge Systematics, Inc.: April 10, 1980, p. 16.

20. Jeff MacMann, "Logan Airport Ground Transportation Alternatives" (Cambridge Systematics, Inc.: June 17, 1980), p. 10.

21. George Jackson, "The 20 Busiest Airports," in Ground Access Survey, Xerox Copy from Massport Planning Department, Dec. 1976.

Chapter 2

The following section looks at the future of ground access to Logan. Forecasts of future airport activity and the ground traffic it generates play an important role in policy making. The latest forecasts are presented to create a realistic sense of the problems that await travelers and politicians by the year 1990 and 2010. It is also instructive to review how forecasts are derived to help the reader gain perspective on forecasting and its uses.

The most recent forecasts of ground traffic generated by Logan (CTPS, May 1982) were based on two factors: (1) the activities going on at Logan (enplanements and air cargo) and (2) the methods used by people to reach the airport. Forecasts were made for 2010; 1990 forecasts were derived from the 2010 results. The translation of Logan activities into ground traffic depends on the second factor above. These are described by (1) mode split - how many people use each of the various modes available, and (2) vehicle occupancy rates - how many individuals are in each vehicle type on average.[1]

Three scenarios were developed with respect to mode split and occupancy rates: (1) present situation extended, (2) moderate increases in public transit and vehicle occupancy rates, and (3) maximum diversion to transit.[2] The last was premised upon major transit improvements such as connection of the Red and Blue rapid transit lines, doubled cost for

parking (it is $6 a day at present), and imposition of an airport access toll.[3] Logan is served to a station at the airport boundary by the Blue Line of the MBTA and between the station and terminal buildings by bus. Passengers from northern, western or southern suburbs, as well as most passengers from downtown Boston, have no direct access to the Blue Line. Most transfer to it from other lines. The Red Line reaches Cambridge to the northwest and Braintree to the south; it includes Park Street, a major downtown station, but an additional transfer is necessary to reach the Blue Line.

The following table indicates the Average Weekday Daily Traffic (AWDT) for 1977 and the estimated 2010 AWDT for each scenario:[4]

Scenario	2010 AWDT (one-way)	Increase Over 1977	
1977 base	(32,550)	#	%
I.	57,900	23,350	78
II.	51,509	18,959	58
III.	38,752	6,202	19

If the methods used to reach Logan in 1979 remain the same in 2010 (Scenario I), then 23,350 extra vehicles will enter Logan on the average weekday. 75 percent of that growth will occur under Scenario II and only 25 percent under Scenario III.[5]

The following are capacity-constrained forecasts under Scenario I. Note the modest increases in Central Artery and Southeast Expressway traffic.

1982 - 2010 Increase[6]

Interstate Route 93	19%
Mystic-Tobin Bridge	9%
Storrow Drive	8%
Callahan & Sumner Tunnels	11%
Central Artery	4%-10%
Massachusetts Turnpike	12%
Southeast Expressway	5%
Route 1A (North to Airport)	30%

During the morning and evening peaks in 2010, the Central Artery will become jammed from the long queues waiting to enter the Callahan Tunnel from the city. In the p.m. hours, both the north and southbound directions will be clogged and the queue will extend as far as the Haymarket Square off-ramp (approximately 2 miles).[7] Volumes in the Callahan Tunnel will increase by approximately 40 percent, and 20 percent in the Sumner Tunnel between 1982 and 2010.[8]

In 2010, the morning peak will have queues from four ramp junctions that will block the northbound Central Artery flow. A lengthy queue from the Callahan Tunnel on-ramp, not estimated to exist in 1982 and 1990, will be congested back onto the Artery.[9] According to the Third Harbor Crossing Environmental Impact Statement (EIS), the southbound direction will be severely congested because of two ramp junctions, queues will extend nearly to the Tobin Bridge on-ramp and the Callahan Tunnel off-ramp. Ramps generally will have volumes in excess of computed capacity. The Route 1A-Logan connection will also have extreme congestion problems.[10]

The LOS F conditions presently existing in the tunnels will be exacerbated in 2010. The constriction point of the Sumner Tunnel (the East Boston entrance) where seven toll booth lanes are funneled into the two-lane tunnel will continue to be a major source of congestion as the toll plaza's capacity will be exceeded in 1990 and 2010. Operating speeds will average well below 15-20 m.p.h. in the peak period.[11]

One indicator of increased congestion is estimation of the number of congested hours of operation. If the patterns of hourly distribution remain the same, the LOS of E or F in the Sumner Tunnel will last for five of the six a.m. hours between 6 a.m. and 12 noon and all nine hours between 12 noon and 9 p.m. At present this congestion lasts three hours in the morning and two in the evening. Currently there are usually few problems in the morning in the Callahan Tunnel. In 2010 LOS E or F will exist from 6 a.m. to 12 noon and in the evening, today's 5-hour congestion period will expand to 8.[12]

These congestion levels can be scaled to approximate the situation in 1990. The 1990 CTPS forecasts used the same assumptions and methods as the 2010 forecast for Scenario I. Scenario II differs only slightly because it arrives at the increase in public transport and vehicle occupancy rates in a linear fashion from 1979-2010 instead of using a more involved process. According to these estimates, enplanements are forecast to increase 20 percent over the 1979 level,

employment 9 percent and air cargo tonnage 39 percent. These activity forecasts apply to both Scenarios. Under I, the 1990 Logan Average Weekday Daily Traffic (AWDT) is projected to be 43,700 vehicles (one-way), an increase of 21 percent over 1979 (36,246), and 34 percent over 1977 (32,550). Under II, the projected AWDT is 16 percent higher than the 1979 AWDT and 29 percent over the 1977 AWDT.[13]

According to the Third Harbor Crossing EIS, in 1990, the Callahan Tunnel will have a 16 percent increase in morning peak traffic and 31 percent increase in the evening. The Sumner Tunnel will have a 9 percent increase in the morning and a 6 percent increase in the evening. Traffic flow will remain at LOS F and toll plaza capacity will be exceeded. Several roads will also experience increased volume including: I-93 (north of the high level bridge) (14%), the Pike (12%), Route 1A (16%), the airport access/egress roads (20%), and sections of the Central Artery (9%). Traffic growth will be more rapid from 1982-1990 than 1990-2010 on the three cross-harbor facilities as well as most of the nearby roadway network.[14]

The 1990 traffic would produce substantial queues. The ramp junctions in particular would be affected. For instance, the almost two-fold increase in traffic predicted for the northbound off-ramp to the Callahan Tunnel would create a queue extending onto the Central Artery with back-ups (of about 1 mile) almost to the Congress Street on-ramp. The average queue time during the peak at the Sumner toll

plaza would increase from its present 5.8 minutes to 10.8 minutes in 1990 and 12.5 minutes in 2010. The Callahan .6 minute wait would become 8.7 minutes in 1990 and 14.5 minutes in 2010.[15]

The huge increases in traffic and congestion between 1982 and 2010 are likely to cause many types of effects. There may be some impact on the potential economic growth in the surrounding areas. The inconvenience of reaching Logan from areas south and west may at some point begin to marginally reduce growth in development ventures. The traffic will have its most adverse affects on business and homes located in the streets surrounding the tunnel portals. Property values in the CBD may at some point also suffer some negative impacts.[16]

Land-use conflicts with East Boston are likely to continue. Although Massport is no longer taking property by eminent domain, recent concerns have revolved around the increased usage of local property for airport-related activities, such as freight-forwarding, parking lots, and car rental storage. With the anticipated increase in traffic, in the next ten years Boston residents are worried about the effects on land use and are now focusing on zoning changes.[17]

The effect of congestion on Logan's growth in passenger and air cargo is likely to be nonexistent. Air travel demand is inelastic because most air journeys serve needs for which there is no practical alternative. The distribution of flights scheduled throughout the day, however, could be

affected by congestion. This congestion could also affect the overall business climate.

The increased traffic will result in worsened environmental quality in the neighborhoods nearby. There will be increases in air pollution, noise, and vibration and a decrease in traffic safety for pedestrians crossing near the tunnel portals on the Boston side. The level of CO concentration will increase at the tunnel entrances. Demographic changes such as a growing elderly population in East Boston may increase the seriousness of the environmental problems in the area.[18]

It is likely that public transportation usage will grow. The increased traffic demand that cannot be met by the roadway infrastructure will probably cause people to change to another mode. By 2010, it is predicted that the Blue Line, bus, taxi, and limo services together will, at a minimum, be serving additional demand equivalent to 12,800 airport-related vehicle trips.[19] If it is assumed that each private vehicle has a single passenger occupant, the 6,400 one way trips represent a tripling of present transit-limo-taxi volumes.[20] Since the total percent increase of Scenario I riders is unlikely to be much greater than 10 percent, most of the shift will be to the limo and taxi modes.[21] This suggests that the CTPS Scenario II, which assumes some modal switch, may be more likely to occur than Scenario I, because of road capacity constraints if nothing else.

The extreme nature of the traffic congestion may cause a perception of deterioration in the relative quality of life enjoyed by citizens in the region as well as those in local areas near Logan. Convenience and the ability to move free of chronic traffic might be viewed by some as indicators of quality of life. One question to consider is whether quality of life is an unconscious force influencing whether/when people become "bothered enough" to act on an issue. Is it ever possible to reflect in a forecast the quality of life as perceived by a local population?

It is valuable to understand not only the information and methdology used in forecasting but how they are used. In 1979, Charles River Associates (CRA) predicted a growth rate for Logan of 5 percent per year and a tripling of passenger enplanements to approximately 45 million by 2000.[22] In 1980, Alan Eng at Massport offered his own upper- and lower-bound forecasts. The upper assumed a growth rate of 4.6 percent or an increase in passenger traffic from 15.1 million in 1979 to 38.7 million in the year 2000. Eng's lower-bound, constructed with less cheery assumptions, projected growth of 3.1 percent.[23] Some industry analysts and aviation planners now view this range as overly optimistic. These professionals contend that continuation of past trends, as implied in these forecasts, is not likely to occur. (Robert Mellman from Charles River Associates, however, remains convinced that the airlines have a bright future.) Eng's forecast was consistent with those of the FAA and AIA among others at the

time.[24]

A revised 1981 rate of 2.5 percent, used in Massport's Bird Island Flats forecasts, is similar to the most recent 1982 numbers. In the latest forecast a high, low and mean forecast is given for each year. The "principal forecast year" is 1987, when passenger traffic increases to: high - 17.2 (growth rate 2.5 percent), low - 16.0, and mean - 16.6 million.[25] The low rate of just two years back is now the high end of the forecast envelope. According to Massport planner Joe Brevard, however, any numbers past 1987 are "just educated guesswork."[26] The envelope is a useful way to capture the margin of uncertainty inherent in forecasting, especially when it spans 7-10 years or more.

Timing can influence the range and accuracy of a forecast. The CRA projections, for example, were completed in the first full year of deregulation which, according to industry analyst Steve Martin, undermined the credibility of the forecasts in the eyes of aviation specialists. The Airlines own forecasts usually concentrate exclusively on changes in their own market share and future performance, and therefore have limited use.[27]

Four main factors influence these air passenger predictions. One of the most important indicators is the state of the U.S. economy. The elasticity of air travel as a function of income and growth is high. Therefore, during times of recession, travel decreases while the opposite occurs during more prosperous times. The Massport forecasts

were based on recent national economy forecasts prepared by Data Resources Inc. (DRI). DRI looks at policy factors such as interest rates and federal monetary policy, among others to derive several scenarios which reflect the anticipated pattern of GNP ("recovery slope"). The outcomes of these scenarios provided the basis for the high and low boundary of the Massport forecast envelope.[28]

The relative strength or weakness of the relationship between the national air carrier industry and the national economy could be significant. It seems that the industry growth path (measured in revenue passenger miles) has generally paralleled national GNP (in real terms) and was most closely correlated during the years 1968 to 1977. Increases in air travel over these years were about at the same rate as GNP increases. Between 1977 and 1979, GNP grew more slowly than air travel and from 1979 to 1981, GNP fell faster than air travel.[29]

Logan passenger traffic has increased more quickly than New England income over the last six years but has paralleled national passenger traffic growth. New England and regional aggregate personal income as a fraction of the U.S. dropped about 9 percent from 1969-1980. At the same time, an index comparing Logan passenger traffic to New England regional income (Logan enplanements divided by constant 1972 dollar New England income), increased by 20 percent.[30] Furthermore, New England economic growth is in sectors that use air travel intensively. The regions's high tech firms are strong,

closely linked to governments and market throughout the continent and Europe, and seem to have a promising future.

The availability and cost of fuel is also a critical element. Fuel cost (30%) and labor constitute the major costs of air transport.[31] Consequently an increase or decrease in fuel prices can significantly influence air fares and levels of demand. However, more efficient models (e.g., the Boeing 767) are to some degree reducing the importance of this factor.

Since 1978, deregulation has played a central role in influencing the numbers of people flying in several ways, primarily by intensifying price competition in major markets. Larger numbers of people are flying and flights are spreading across the peak. Many industry analysts maintain that the full implications of deregulation nationally and on Logan's operation are not yet fully apparent.[32]

Three factors, in addition to air traffic growth, contribute to increased ground traffic:

(1) Greater numbers of people are living and working outside of the CBD where there are few transportation options besides private car. Significant growth, especially in hotel and office space is occurring in the central area at present, but a corresponding surge in non-auto modes to Logan is unlikely. One reason is that most Logan users who reside in the region leave from or return to their homes, not the CBD.

(2) Several planned Massport harbor development projects are likely to increase traffic especially the Bird Island

Flats (BIF) project, a cargo and mixed use development, located adjacent to Logan and to be completed in 1987. Anticipating increased traffic as a result of the BIF development, the Massport EIS has put forth about ten provisions to mitigate the adverse impacts. These include: a "Logan Commuter Plan" - a program of ride sharing and van pooling, MBTA pass subsidies, higher employee parking fees (employers will bear this cost), limited BIF parking, support of increased bus and limo service, ferry access to BIF, transit access to BIF and soon.[33]

Massport expects these measures to improve the transit/ferry modeshare from its existing 6.6 percent for airport employees to 9.1 percent. Further, employee auto occupancy is predicted to improve to 1.4 from 1.2 per vehicle in the p.m. peak hour.[34] Massport officials say specific elements of these provisions will be implemented as they become relevant. The use of a 40-seat shuttle bus, for example, will not be necessary for some time, so a 20-seat van is scheduled to begin service first. To promote staggered scheduling and help defuse congestion, a provision in the Massport-BIF developer's agreement requires that not more than a certain percentage of employees leave at peak hours. The developers will incorporate this into leases with their tenants. Despite the limited transit market, Massport is also considering renovating MBTA stations to encourage greater usage.[35]

No one I interviewed at Massport mentioned these measures, however, in discussions about the access issue in general. The silence may reflect a lack of expectation that these measures are likely to have much effect.

(3) Since deregulation in 1978, airline pricing strategies have been designed to improve load factors. Deregulation has influenced the numbers and time when people travel (e.g., the month, week, time of day, and destination). Price discrimination is vigorous. There is evidence of these effects at Logan, said Steve Martin, but no hard data yet. The air traffic controllers strike had a similar though temporary effect on the spread of flights. During and following the strike, the number of planes flying at each hour was carefully regulated.[36]

All forecasts incorporate uncertain factors. A sample from a past forecast for Logan exhibits one reason why some apprehension about forecasting is justified. In 1972, the BTPR forecast that enplaned passengers a day at Logan would reach 25,300 by 1975, and 33,000 in 1980.[37] In 1980, they were 41,600.[38] In 1972, the average weekday daily traffic (AWDT) two-way volume of the Sumner and Callahan Tunnels was predicted to increase from 62,000 in 1970 to 92,000 in 1980 under an assumption of unconstrained vehicle demand and 70,000 if constrained.[39] In 1982, on the average weekday, the observed two-way volume of the Sumner and Callahan Tunnels was 82,800 vehicles.[40] The three harbor crossings carried 33,465 vehicles one-way to or from Logan and 67,000

on a two directional basis.

It is unlikely that forecasting has become more accurate since 1978. According to traffic consultant Brian Day, there is a factor difference of 333 percent in growth estimates, ranging from 1.5 - 5 percent per annum, which have occurred in the past three years. In the Logan Land Use Master Plan Study (November 1981), the consulting firm of Wallace, Floyd, et al., and Griffith Associates stated:

> Forecasts of air travel are historically unreliable. DeNeufville has shown that half of the passenger forecasts sampled by him were incorrect by approximately 20 percent, only six years after they were make.[41]

(Note: the 20 percent refers to the growth rate.)

Massport must consider the implications of its forecasts before they are announced to the general public. As one aviation staff member pointed out, it is in Massport's interest not to alarm the local community with forecasts of immense growth. He said that as a result, Massport tends to "understate" its forecasts whenever it can and often avoids any press on the issue of growth. This is a change from the 1960s when the approach involved large growth announcements to justify big projects. Now it seems that Massport's aim is to avert any charges that such projects are needed.

When one reviews the forecasts of Logan growth, it appears that forecasts are guided by the trends occuring at the time the forecast is made. Increasing travel in the late 1970s were reflected in the optimistic CRA forcasts of 1979. In the early 1980s, in the midst of increased fuel prices,

economic stagnation, and declining air travel, the projections become more conservative. Will the present surge in air activity and the upward movement of the economy result in another revision?

Forecasters acknowledge the role that the current environment plays but maintain that forecasts do not reflect economic cycles - though no one can be sure if cycles are long-term or not. Some factors that affect forecasts are one-time events (e.g., initial response to deregulation) while other factors will reoccur at different times with varying severity (e.g., national economic recession, fuel price changes). Consequently, a steady state is predicted. The fact that the parameters of the "state" vary depending on the situation at present merits consideration.

Each forecast scenario has different implications for access demand over the long term. The CRA scenario is the worst case, from a traffic standpoint, with 5 percent growth per year. Drastic measures would be necessary to enable Logan to continue to function under this case. Even with 1.5 percent growth per annum, some deterioration in Logan access and the rest of the Boston transportation system is highly probable.

The predominant response of Logan-bound travelers in the face of worsened traffic congestion and lowered travel time reliability will be to leave themselves more time for Logan access trips, and otherwise to endure the increased cost in time, convenience, and work productivity.

Footnotes: Chapter 2

1. Cathy Buckley, "Logan Airport Ground Traffic in the Year 2010: Three Scenarios" (CTPS Memo: May 24, 1982), p. 1.
2. Ibid., pp. 1, 3, 11.
3. Ibid., p. 11.
4. Ibid., p. 14.
5. Ibid., p. 14.
6. Draft "EIS, Third Harbor Tunnel Project, Interstate 90" (Boston: Dec. 1982), p. 112.
7. Ibid., p. 128.
8. Ibid., p. 121.
9. Ibid., p. 128.
10. Ibid., p. 130.
11. Ibid., p. 130.
12. Ibid., p. 130.
13. Cathy Buckley, "Logan Airport Ground Traffic in the Year 1990" (CTPS Memo: June 22, 1982), p. 1.
14. Draft "EIS, Third Harbor Tunnel Project," pp. 36-37.
15. Ibid., p. 37.
16. Ibid., p. 183.
17. Ibid. p. 183; and discussion with Alice Boelter, Planning Department, Massport: May 8, 1982.
18. Draft "EIS, Third Harbor Tunnel Project," p. 192.
19. Ibid., p. 156.
20. Discussion wtih Cathy Buckley: May 9, 1983.
21. Ibid.
22. Charles River Associates, "Logan International Airport Passenger and Air Cargo Forecasts" (Boston: Dec. 1979), p. S-1.

23. Joe Brevard, "Updated Logan Passenger Forecasts for 1981" (Massport Memo: June 23, 1981), p. 1.

24. Ibid., p. 1.

25. Joe Brevard, "Medium Range Logan Traffic Forecasts" (Massport Memo: April 8, 1982), p. 2.

26. Ibid., p. 1.

27. Interview with Steve Martin, Aviation Industry Analyst, Massport: March 1, 1983.

28. Joe Brevard, pp. 5-6.

29. Ibid., p. 7.

30. Ibid., p. 9.

31. Discussion with Robert Mellman, Charles River Associates: May 9, 1983.

32. Interview with Steve Martin.

33. "Final Environment Impact Report, Proposed Development of Bird Island Flats" (Massport: April 30, 1981), pp. 141-144.

34. Ibid., p. 106.

35. Interview with Richard Marchi, Assistant to the Director of Aviation Department, Massport: April 12, 1983.

36. Interview with Steve Martin.

37. Boston Transportation Planning Review (Boston: 1972), p. 35.

38. "Massport Annual Report 1981" (Massport: 1981), p. 36.

39. Boston Transportation Planning Review, p. 55.

40. As mentioned earlier, the definition of capacity can change. It is possible that the estimated capacity of the tunnel now vs. during the BTPR in 1972 is different. Recently, lower levels of service and a wider spread of peak travel may be influencing the numerical capacity of the facility.

41. Wallace, Floyd, et al. and Griffith Associates, "Land Use Master Plan Study, Logan International Airport" (Boston, Nov. 1981), p. 70.

Chapter 3

There are physical and operational solutions to the ground access problem. The main physical solutions put forth in the last 15 years include: a general purpose Third Harbor Crossing, a special purpose harbor crossing, and improvements to the MBTA. The political and technical aspects of each solution have been debated and ultimately viewed as inadequate solutions at the time they were considered. After a brief summary of these physical proposals and their problems, operational responses will be addressed. Explanation of the concept and features of operational responses will clarify why they should be pursued to alleviate ground access congestion. Two examples of operational solutions - increased limo usage and one-way tolls - will then be explored in depth.

Airport-destined traffic from the corridors with the highest demand compete with non-airport traffic for the limited capacity of the Sumner and Callahan Tunnels. Any physical solution to this limitation in the Boston transportation network, such as a Third Harbor Crossing, would entail huge investment costs and require years for implementation. Although earlier I concluded that the prospects for a Third Harbor Crossing are dim at best, the issues around the debate are at the heart of whether a physical solution is appropriate. For this reason some of these issues will be explored further.

The controversy surrounding the Third Harbor Crossing has focused mainly upon the traffic benefits of the tunnel vs. negative community and environmental impacts. Several options for the exact alignment of the tunnel have been discussed but they all involve either significant disruption of the East Boston community or represent future Logan growth to the residents who are strongly opposed to any tunnel. The options also have unfavorable environmental externalities. Furthermore, the estimated cost of a tunnel approaches 2 billion dollars. Together these factors have swayed the opinion of several prominent politicians against any action for a tunnel in the near term.

A special purpose tunnel, first proposed by the BTPR in 1972, would have gone far towards alleviating the disruption problem. The concept of a special purpose facility, restricted to limos, buses, taxis and trucks destined specifically for Logan would have insured a high level of service for this airport-bound traffic, and would have provided a powerful incentive for airport travelers and visitors to leave their cars behind. The anticipated diversion of airport travelers away from auto use was expected to have a significantly beneficial effect on the congestion in those tunnels. The crossing was opposed by the incoming Dukakis administration both because of his dedication to transit and political considerations.

Major improvements to the MBTA is another physical solution considered to relieve congestion. The response of the

current governor to the ground access problem at Logan has been to call for rapid transit, most often to connect or improve service between the CBD and the airport. Dukakis has a long reputation as an avid devotee of the MBTA and viewed it as the "solution." This response, however, ignores the spacial distribution of demand. Roughly two thirds of Logan's passengers now come from beyond the MBTA network.[1] There is no reason to assume that the spread of demand will change in the near future.

Traditionally, and especially in the 1970s, the MBTA Blue Line, with Massport bus service to access Logan, has been an appealing option because of the high unused capacity that the system offers without any deterioration of service quality when demand rises. This performance capability stands in striking contrast to highway access, which is limited to about 1600 vehicles per hour per lane.[2]

Despite these Blue Line attributes, its use as a means to Logan has not been attractive to most air travelers for several reasons. They include: the number of transfers required, the unreliability of the service (perceived and actual), the difficulty of handling luggage, and the limited geographic spread of MBTA lines. As a consequence, ridership of the Blue Line has remained at a low 6 percent from 1970 through 1979.[3]

It seems almost impossible to make the MBTA a viable alternative to highway access to Logan. By extending the Blue Line to Park Street and directly to the Logan terminal,

it is estimated that the mode split could rise from 6 percent to 9 percent. Under conditions of extreme future highway congestion, the transit share might increase to 13.6 percent.[4]

Governor Sargent vetoed such Blue Line improvements in the early 1970s due to cost considerations, and this decision has been accepted by subsequent administrations. The 1975 Logan Master Plan also rejected improvements to the subway access system to Logan:

> ...even if rapid transit lines served the Airport directly, with no transfer delays, rail transit inherently lacks the "flexibility" to pick up the large number of passengers living in scattered locations throughout the suburbs...The result is that fixed rail transit cannot begin to compete with buses or automobiles and consequently can never attract enough airport-destined riders to significantly reduce harbor crossing travel demand.[5]

If anything is to be done about the Logan access problem, then the planning emphasis needs to be directed towards less ambitious, less costly and simpler approaches to the problem, making use of existing capital facilities. Operational responses do not respond to the access problem as simply one of transporting people and goods to and from the airport, rather, the transportation objective is to also ensure minimum environmental and neighborhood disruption. On and off through the 1970s there has been support for this approach. The operational simplicity and potential effectiveness of these methods have served to enhance any support for their implementation. Because construction requirements are low, lead time for development is short and costs and disruption

are low. Unlike large scale ventures, operational improvements are able to respond to changing population trends and patterns of behavior. They may be more reponsive in two ways: (1) the nature of the technique (e.g., traffic management) lends itself to reacting swiftly; (2) because less investment and lead time are required there is less risk involved if a technique needs to be altered to become more effective (e.g., access toll). However, the benefits of operational strategies tend to be undramatic as well.

Several types of operational responses to ground access have been considered in Boston during the last decade. These include: ferry service, remote parking facilities with shuttle bus, traffic management techniques, downtown check-in facilities, an access toll, employee car/van pooling programs, minor improvements to the MBTA and the two elaborated on in this analysis: one way tolls and increased bus/limo usage (hereafter referred to as limo).

Many of the techniques normally considered to be likely operational options are infeasible to implement. Some, like priority lanes, are technically infeasible. It is not possible to make one lane of a two-lane tunnel into a special lane. Other methods, like an access toll, are politically infeasible. In 1972, an EPA study recommended a 5 dollar access toll to 'enter' Boston as part of the "State Implementation Plan to fulfill the requirements of the Clean Air Act. This proposal was met by a storm of public protest and set aside.[6]

The two operational responses discussed in this paper appear to be technically feasible in most ways but encounter problems in implementation on other fronts. Massport supported a pro limo policy, without realizing the political trouble it would encounter with the cab drivers and other operational difficulties. A one-way toll policy is technically satisfactory, but faced intergovernmental problems especially during debates over the Third Harbor Crossing. The effects of limos and one-way tolls in theory will be presented first looking at the technical data and operational features. How the solutions have fared in practice to date will then be assessed. The current situation will be summarized highlighting operational problems that have emerged. Finally, political and institutional issues will be discussed.

The following section will first put forth the theoretical advantages of increased limo usuage. A presentation of the history of the policy reveals why and how the practical realities make implementation problematic. Finally, I suggest why the approach should remain alive - despite the lack of support at present

Technical studies provide one basis to assess the feasibility of an operational method like limos. Unlike other types of operational options, there is relatively little recent data on limo usage and potential in the Boston area. No one with whom I spoke about limos mentioned data to explain why they did or did not support the idea. Three

earlier studies, however, provide valuable analysis: Colverdale and Colpitts (1970), BTPR (1972), and the 1975 Logan Master Plan. The conclusions of all three put forth a rather persuasive case to support limo usage.

The Colverdale and Colpitts survey provides an analysis of attitudes of Logan Airport users. Users were asked to rank order preferences for new transit services to Logan. "Direct suburban express bus service" came out on top of the list. "Replace the Airport shuttle bus with rail service," was second, and last was "direct downtown express bus service to Logan."[7] The factors people were most interested in seeing improved, which included travel time, convenience, and travel environment, could be satisfied by a limo or bus service.[8] These factors were used as a basis of discussions about limos in the 1975 Master Plan.[9]

The 1972 BTPR study mainly addressed the issue of a harbor crossing but it also assessed a number of other alternatives. Of these alternatives, the study concluded that one of the two "most effective individual improvements" to the existing Logan congestion was limo service.[10] The Review performed an analysis to determine the proportion of trips divertable to limo and found that between 30 and 55 percent of the potential "market" might take limos. This outcome depended on a number of actions such as: (1) making parking at Logan more difficult by increasing parking fees and decreasing the number of spaces; and (2) provision of special limo lanes or a special purpose harbor crossing to increase

the relative speed of travel by these modes during the peak periods.[11]

In 1975, the Logan Master Plan concluded that an "expanded limo system would provide the greatest net benefits of reducing traffic congestion at Logan."[12] The Plan detailed the most likely market areas in which expansion of services could occur, and requirements for fringe airport parking in support of the limo services. The Plan analyzed limo demand and operating cost per route at four alternative levels of service. The Report estimated that limo usage in some areas might triple, with the possibility of even greater demand in outlying sections such as that between Routes 128 and 495.[13]

The projection of ridership until 1990 anticipated that with improved levels of service, 27 percent of Logan passengers would use limos. In drawing this conclusion, the Plan study team recognized that projecting growth of ridership is difficult because of lack of sufficient data. Nonetheless, the team assumed that the high (1973-74) growth rate of limo usage (23 % per year) would continue. This rate depended on implementation of a "favorable state policy" coupled with an "aggressive, coordinated" limo program. The program included: eliminating licensing problems, securing fringe parking, a Massport marketing effort, a Logan parking price increase, and head-of-the-line privileges for limos at several points in downtown Boston. The plan did not rule out subsidies, especially during the start up phases.[14]

Limo service can tap the markets of the suburban and outlying areas of Boston. It can also attract airport employees, non-residents, out-of-towners, and those with luggage. Passengers can also enjoy a considerable financial savings by opting for limos. The limo fare to Lowell was $6 in 1975 whereas a taxi cost $28.25.[15] If demand for services increases, costs to the operator drop and the operator may lower fares or increase the frequency of service. Unlike transit services, limos offer a guaranteed seat and deliver directly to the terminal.

Many of the operational advantages of increased limo usage were mentioned earlier - such as little or no construction, low costs, short lead time, and policy flexibility. Limos can also be flexible both in the areas they serve and size of vehicle (bus, car). Progress can be monitored and assessed to decide on any changes on routing or timing.

Although there seem to be many attractive features to using limos to help alleviate congestion problems, the feasibility of expanding their use, given operational and political considerations, is problematic. A review of the history, the various parties involved, and their stake in the issue clarifies why limos remain a controversial and a very modestly utilized strategy at present.

The agencies and other parties involved in any effort to encourage use of limos include: Massport, the Massachusetts Department of Public Utilities (DPU), the Massachusetts Department of Public Works (DPW), the Massachusetts Turnpike

Authority (MTA), the City of Boston, the taxi industry and the limo operators. Each of these actors has a different stake in the policy.

Massport is concerned with the overall problem of access to Logan. It is interested in limos mainly as one option that might help diffuse congestion and ensure Logan's continued accessibility. The MTA and the City of Boston would be involved if a limo policy included provision of head-of-the-line privileges and/or other physical improvements on streets near or through the Sumner and Callahan Tunnels. The City also regulates the taxi industry while the DPU regulates the limos. Since limo service is likely to require parking in outlying areas then discussion with the DPW would be necessary to review the status of any potential sites for acquisition of lots. Meetings with existing owners of lots such as shopping malls would also have to take place. The taxi industry sees itself very much a part of any changes to encourage limos as they also seek increased mode share of the Logan market. Finally, the limo operators would also have a stake.

Debate about the increase usage of limos began in the early 1970s (e.g., the BTPR Study). Although it was not until 1976 that Massport incorporated an explicit policy statement about limos. This statement set forth four ways to actively encourage use of limos and decrease the number of private autos. They included: (1) "identifying new areas to be served;" (2) assisting with the permit process; (3)

working with the City of Boston to improve routing for limos in the city; and, (4) "to provide for priority lanes and head-of-the-line privileges."[16] In 1976 Massport met with limo operators to discuss routes and worked to make the public more aware of the services available. Massport provided "a public relations subsidy, not an operating subsidy," said Cathy Donaher, by publishing brochures with limo schedules and fees.

Cab drivers, in turn, saw their most lucrative rides jeopardized by this vigorous interest in limos. Boston cabs and cabs from outlying areas, who technically are not allowed to pick up fares from Logan but prefer to "dead head" the way back rather than lose the fares, began to fight limos in the DPU licensing process. All scheduled limo operators are required by law to satisfy certain regulations overseen by the DPU. One part of this process is a public hearing in every city and town the route passes through. Together the suburban and Boston cabs were a significant force. Large numbers of cab drivers would come to each hearing and vociferously pressure the DPU to deny approval of new routes to limos which passed into their areas.

The cab drivers feel that Massport's aim to reduce traffic and pollution "has a hollow ring." After all, reported Taxi Digest, a bus (or large limo) "is some three times the size of a car" and "spews more pollution."[17] The cabs, with an extremely effective network and a few large operators, were prepared to "fight every step of the way."

In the spring of 1977, cab drivers went on a 3-day strike, accusing Massport of unfair support of their competition. Massport had assisted a limo operator to secure a permit for a route which included shuttle service to a Newton hotel. Ann Hershfang, Massport Board Member at the time, said that judging by the Letters to the Editor of the Boston Globe, public opinion was not very sympathetic to the strike but it did cause substantial disruption. Negotiations took place with the State acting as a broker between the City which represented the cab companies, and Massport. Share-a-cab, a program which enables cabs to have access to an additional segment of the market, emerged as a result. Hershfang, a strong advocate of promoting limos, called the share-a-cab outcome a "gift to the cabs."

As a result of the upheaval of the strike, Massport maintained, during the 1977-1979 period, a relatively low profile on the limo issue. Again in 1980 the agency did some demand analysis looking at existing routes and isolated corridors which were not being served. Ted Baldwin, a Massport aviation planner at the time, recalls that the main issue for limo operators was the high capital costs (due to interest rates) of expanding their fleet to meet this estimated demand. The operators urged Massport to buy vehicles and then lease them back. Despite Massport's overall interest in limos, the agency refused. Such an action, which could be viewed as a limo subsidy, was "political dynamite" for Massport, because it could provoke the cab drivers again.

There are mixed views about Massport providing subsidies of any type to limo operators. Some Massport staff members think the agency should not become involved in such activities in the private sector. Others like consultant Brian Day support efforts to subsidize "high-occupancy modes" such as limos. He is convinced that Massport should cross subsidize limos using revenues from the imposition of higher landing fees on air carriers.

The volatility of the cab drivers surfaced again last year when they went on strike for 3 days. They alleged that unscheduled limos, many not properly authorized, were soliciting passengers inside the terminals and demanded that Massport intervene to stop the limo drivers. One observer felt the resolution of the action, setting up a "limo pool" for unscheduled services that require operators to provide the flight and passenger name before leaving the pool, favors the taxi position because a limo pool lessens the presence of limos at the curb. On the other hand, unlike before the strike, neither taxis nor limos can enter the terminals to solicit passengers.

Another policy Massport considered in 1976 regarding limos was priority lanes. The agency's commitment was tempered by Boston's angry reaction to the introduction of diamond lanes (priority lanes for high occupancy vehicles) on the Southeast Expressway in 1977. Their removal was termed "good news" by the local news media.[18] Additionally, there are operational problems with priority lanes. "You can't put

them where you want them," observed Massport Chair Robert Weinberg. They are "out of the question" in a two-lane tunnel, also, the Boston street configuration is not easily adaptable.

At present an informal relationship between Massport and limo operators exists. Massport staff carries out demand analyses and quietly encourages service expansion. There is no data on the success of these efforts, according to Joe Green, Director of Massport's ground transportation services. Massport has also worked to streamline the complicated bureaucratic process to secure limo licensing permits.

These efforts combined with cutbacks in the MBTA have resulted in a rise in limo passenger volumes. From 1970 to 1977, limo mode share increased from 6.0 to 8.4 percent, thereby surpassing transit as an access mode.[19] Since 1978, 25 new limo services have been added. Of these, only two - one limo and one bus - are scheduled.[20] Scheduled services, offering specific routes at specific times, as mentioned earlier are required by law to have a permit from the DPU. Non-scheduled limos do not need a permit and can operate from any city or town. Massport requests that unscheduled operators have a letter with approval of operation from its base city or town. Unscheduled limos are not allowed to publish schedules or solicit passengers; passengers must make reservations in advance.

Massport records since 1981 show improving revenues and numbers of passengers on most bus and limo lines.[21] The rise

may be illusory and just a projection of more complete data gathering since 1981.[22] In an effort to have a more accurate picture of limo operations, a database of services is due to be completed this month. The "pool" for unscheduled limos has probably made it more difficult for unscheduled services to circumvent payment.[23] Limos might be encouraged to understate their popularity due to the structure of Massport's fee system. To access Logan, limos pay 5 percent of gross revenues whereas taxis pay $.50 for each trip. It is worth considering how much Massport stands to gain financially from limos vs. cabs.[24] According to M.E. Sullivan of Massport, this aspect of ground transportation has not been explored.

Despite these positive developments and recognition that ridership was increasing, most people interviewed for this paper felt that under current pricing and operating conditions, the potential market for limos was extremely limited. One Massport staff member felt that only a 0.5-1.0 percent increase in mode share could be achieved by more extensive activity.[25] Furthermore, almost no one I spoke to seemed to have anything positive to say about the future of the approach though many advocated it in principle. Two types of problems - operational and political - were cited. Operational problems included the infrequency of service, the poor peak hour service that is "unlikely to improve," and the limited market.

Perhaps there are several reasons limos are not being widely used. There are too many other "costs" incurred for

passengers. Frequent travelers, for example, are less sensitive to transport prices and tend to value their time highly. A short outbound journey can be time-consuming because the limo may make several stops. Also, while passengers may expect taxis to be available when they arrive at an airport, they may not know of a limo service. For an inbound journey many travelers have to transport themselves to the limo service.

Aside from the inflammatory nature of the cab situation, a limo policy entails other political considerations. Massport is more directly involved with this issue than other agencies and consequently it is likely to be viewed as "responsible" for any blame or receive the credit for any outcome of a policy. When the cabs are causing chaos in all of Boston, or parking becomes impossible at Logan, it is not easy to divorce Massport from the event. Massport assumes that the taxi industry will continue to react as it has in the past, which constricts the agency's ability to actively promote an explicit limo program.

The threat of a cab strike is immediate while any benefits of increased limo usage are long-term. Unlike the use of one way tolls which are discussed later, a "trial period" cannot be used to measure success. Public outrage in reaction to changes such as increases in parking fees and/or fewer spaces available are likely to be an immediate liability. People may not yet be prepared to tolerate such inconvenience in their lifestyle to help alleviate what they

consider a "normal" part of Logan travel. Weinberg felt that if Salvucci had a "bureaucratic triumph" on the Third Harbor Crossing issue (i.e., building a consensus and resolving the funding issue), then he would be "allowed a few potential failures" (i.e., controversial policies) such as some type of limo subsidy.

Weinberg views ground access as EOTC's problem. Since the degree of momentum at the agency is so strongly influenced by who is governor and who 'controls' the Board (i.e., which governor has appointed the majority of Board members), it is not surprising that Massport's initiatives on the issue during the King administration were limited by his agenda for the Third Harbor Crossing. Furthermore, some Massport staff question whether it's Massport's role, or if only EOTC has authority to promote limos - especially when the issue of subsidies is involved.

Support by other public agencies is another necessary political consideration which an agency such as Massport must not overlook. For example, agencies sensitive to the concerns of the East Boston community might be reluctant to support any initiatives that could be interpreted as promoting Logan's growth. If Massport aggressively advocated a limo policy, many constituencies, including other agencies, would be affected. Some public responses may be negative - the DPW might receive complaints from communities opposed to using DPW lots for airport fringe parking. In other instances, a forceful limo policy might coincide with the

aims of an agency such as the City of Boston. The "philosophy" of the City, according to Phil Caruso, is essentially an operational approach supporting the use of "what is existing before there are any construction efforts." A limo policy seems to be the type of policy the city would consider. Also, a limo policy might possibly be agreeable to residents of East Boston (another concern of the City) if residents begin to view limos as as option to aid in congestion relief and the need for a Third Harbor Crossing.

Despite the political risks involved in promoting limo usage, I think a strategy should be actively considered. I am convinced that with careful political planning, the commitment of Massport and EOTC, and mobilization of public opinion to challenge the position taken by the cabs, there is a real possibility of substantial increase in usage of limo services. The cab dilemma must be carefully addressed. These efforts might also generate some political benefits but they will not likely emerge for several years. Thus, pursuing a limo policy needs political figures willing to commit themselves with few pay-offs at the outset. Over time, if several constituencies (e.g., business in and outside of the CBD, East Boston, legislators, etc.) began to apply pressure on cabs in conjunction with favorable media attention to limos, the taxi industry might begin to find itself isolated and in a less powerful position.

Since 1972, the percentage of private cars used to access Logan has decreased from 82.4 to 67.7 percent. Although the

largest mode increase was in taxis, increased willingness to use modes other than private car should be noted. Still, most people do not think of taking a limo to Logan. For a limo policy to be viable, these attitudes must change. Shifts in public opinion can stem from many sources: a united political front on the issue, persuasive technical information, vigorous public relations and marketing, financial incentives, etc. These would have to be explored in depth. Finally, a limo policy requires energy and commitment by those willing to take on the task of organizing a serious attempt at this approach. This would require financial backing, a willingness within public agencies to support active development of the policies, and sheer brain power.

The use of one-way tolls, an operationally simple method to improve the traffic capacity in the Sumner and Callahan Tunnels, is an idea which has been discussed in Boston for over ten years. Since "90 percent of the arguments are political," according to Boston Traffic Commissioner Vitagliano, it is not surprising that this "logical approach" to improve access was not so simple to implement.[26] This analysis will look at the technical studies of one-way tolls in Boston followed by an explanation of some of its traffic features. Then, the history and political issues will be presented which will clarify why this policy has been implemented.

The one-way tolls instituted in the Sumner and Callahan Tunnels and the Tobin Bridge require motorists to pay double the toll in the inbound direction into Boston and nothing outbound. The policy is designed to relieve congestion on the Central Artery for northbound motorists in the evening and ease the traffic to Logan in the Callahan Tunnel. The technical justifications for a one-way toll policy include favorable data from recent studies and many attractive operational features. The technical studies performed by Tom Lisco (CTPS, 1980), Day (Massport, 1982), and Chia (MIT, 1983) have all concluded that one-way tolls would aid traffic flow.

Lisco's study concludes that one-way tolls are not especially useful. Robert Weinberg maintains, however, that Lisco answered the wrong question in the right way. He determined that one-way tolls would have negligible speed effects. When Lisco's data are applied to the "right" question - that of potential tunnel capacity - then, as Day's study points out, they suggest a potential capacity increase of 7-14 percent. Day concluded that 200-300 additional vehicles could use the facility in the p.m. peak hours.[27]

David Chia's analysis of one-way tolls examines the subtleties of toll booth and tunnel interaction. The toll booths and the tunnel have service times that work in a series but continue to fluctuate. Once the booths are removed, and people don't slow down at that point, the tunnel itself clearly becomes the point of constraint. The tunnel

will remain congested; for any given individual it may not be better but the number able to pass through should be greater.[28]

There are also several operational advantages to one-way tolls including many of the characteristics mentioned earlier. The cost is low, lead time is short, construction requirements minimal and overall disruption is low. The nature of one-way tolls makes a demonstration period easy although Boston is the only city to ever have a demonstration. Perhaps this suggests that policy makers were uncertain of the outcome. There is practical experience to draw on from other cities. California has operated about nine bridges with one-way tolls since 1969, including the Golden Gate Bridge. The New York-New Jersey Port Authority has operated nine bridges and the Lincoln and Holland Tunnels with one-way tolls since 1979. One-way systems in all of these cases have been deemed successful because of increased capacity of the facility and improved traffic flow.

In the Boston debate over one-way tolls, which originated from a 1971 U.S. Department of Transportation report, several parties have been involved over the years. The owners of the facilities are key players; the MTA operates the tunnels while Massport operates the Tobin Bridge. The City of Boston is involved because many of the roads to and from the facilities are their responsibility. It is helpful to have the support of the Traffic Commissioner of Boston, who is a member of Massport's Board. The approval of the Mayor is

also useful. Other concerned groups include the tolltakers, the East Boston community, and the local banks.

Both Massport and the MTA floated bonds to build their respective facilities and, hence, are responsible for repaying a fixed sum to the bondholders. Until the facilities are paid off, the banks have a claim on the asset (the facility). If anything should hinder the revenue gathering ability of the agencies to make their payments, technically, the banks could intervene.

Many of the tolltakers have their jobs at stake. Their acquiesence is necessary for the smooth implementation of the policy.

Finally, the Governor plays a role in two ways: first, he makes appointments to the Massport and MTA Boards; second, the willingness of EOTC to back selected policy initiatives often stems directly from the Governor's stance on the issue.

The coordination of these actors is no simple task. As the history of the issue shows, there is no "natural" leader, or constitutional home for this policy other than EOTC. Despite some debate about the idea prior to the Lisco study, there was little progress when only Massport and the MTA were the central agencies involved in the discussions. Massport favored one-way tolls while the MTA opposed the idea arguing that the change would result in diversion of toll revenues costing the agency $600,000 annually. The MTA postulated that a one-way toll system with double fares would result in a 7.3 percent reduction in traffic in the Sumner Tunnel.[29]

To avoid the tunnel some drivers would enter the city over one of the three free bridges - via Malden, Wellington, or Route 93.

Another reason the MTA was opposed to the toll policy, though not explicitly stated by MTA staff, relates to the MTA's support of the Third Harbor Crossing. The MTA, former Governor King and other strong proponents of the Third Harbor Crossing believed that one-way tolls should only be considered in the context of analysis of the Third Harbor Crossing. Thus as long as King was Governor, there would be little progress on one-way tolls as an independent option to improve access in the short-term. Vitagliano suggests that the MTA was "foot-dragging" because, like King, they saw the traffic relief generated by one-way tolls as detracting from the case for a Third Harbor Crossing.[30]

Despite the opposition of the MTA, the studies produced some interest. But any hopes for the policy vanished when King gained "control" through appointments to the Massport Board in 1982 and delayed further discussion. Only after Dukakis was reelected late that year and, by a quirk, regained control of the Board did the issue appear in the forefront again. Secretary Salvucci then initiated and became the driving force behind the adoption of the plan.

Two other circumstances aided the chances of one-way tolls' success. Ken Pierson, Operator of the Tobin Bridge for Massport, took an early retirement. Pierson had been adamantly against one-way tolls, although Massport staff

could only speculate on the reasons why. Their ideas included: (1) that it was a "turf" issue - his staff would be cut; (2) that he considered one-way tolls to be unsafe because cars would speed; or, (3) that he just took a stand and committed himself to it. The second development is the approaching conclusion of the MTA Director John Driscoll's present term this July. Since Secretary Salvucci, a major power behind one-way tolls, has a lot of influence in the Governor's transportation-related appointments, it is not illogical that Driscoll felt some pressure to agree to a plan.

Before the MTA would concur, it insisted on its own study to assess the effects of diversion of cars on MTA revenues. The consultants estimated $600,000, but suggested that an experimental period would be the only way to provide a basis for reliable forecasting. Also, according to a Boston Globe report, the revenue losses would be paritally offset by labor saving of $400,000-$500,000 so that the net cost would "probably be $100,000 to $200,000 a year.[31] Citing "uncertainties" in the 1977 data the firm used, one of the consultants admitted to David Chia that the parameters of the 1983 study were continuously altered until an appropriate number emerged. "There was no methodology," observed Chia who reviewed the report.[32]

The toll collectors remain opposed to the policy. Their union, affiliated with the International Brotherhood of Teamsters, has sued Massport. An injunction to delay the three-

month demonstration was denied, but it is interesting to note that the suit was filed when removal of the toll booths was half completed.[33] Massport's Executive Director, Dave Davis said that none of the 70 tolltakers would lose their jobs if the innovation became permanent.[34] It seems the toll collectors are not satisfied with reemployment elsewhere in the agency. Additionally, some of those not switching have had to accept less appealing shifts.[35]

Finally, residents in the East Boston and Chelsea areas are worried about traffic problems associated with the new policy. Increased congestion may result from diverted traffic using local streets to avoid the high inbound toll. There is also concern that cars will be traveling at excessive speeds in the outbound direction because they will not be required to slow down at the toll booths. The Board of Aldermen in Chelsea adopted a resolution urging Massport and the MTA not to go ahead because of these issues (and their concern with the lay-off of Chelsea residents employed at the facilities).[36] There has not been any further action against the experiment; it commenced on May 2nd.

Clearly most of the debate surounding one-way tolls has had to do less with whether it will help the traffic problem than with the political concerns of each of the parties. There are some positive political characteristics that might appeal to agencies. The number of agencies involved allows any blame to be diffused among them. Furthermore, the demonstration format offers an excellent opportunity for agencies

to "save face" if needed. Another appealing aspect of one-way tolls is that it is not disruptive to people's habits; there is no massive construction or forced behavioral change. People can still drive their cars just as before May 2nd. Finally, public officials like to be seen as taking action on issues to show that government "cares." One might argue that one-way tolls is significant because it represents some activity to improve the situation while its proponents have no illusions about it solving the problem.

One of the political difficulties of one-way tolls according to Richard deNeufville, MIT professor and airport specialist, is that "there is just too much inertia in the system." These projects require a lot of time for what seems like a rather uneventful result. Weinberg would probably agree. It is easy, Weinberg says, to think and develop useful ideas but it is making it happen that takes time. "There are no aggressive proponents in the bureaucracy, so it sits," he commented. Several people said they weren't surprised that one-way tolls took so long. No one I spoke with thought one-way tolls would not help, but some viewed it as a more significant solution than others. A top member of Salvucci's staff at EOTC calls one-way tolls a "band-aid" solution. "But a band-aid can halt the blood coming and keep away infection," observes Tom Humphrey, MIT research associate. DeNeufville and Chia did not view the technical information as adequate before Chia's contribution. However, once the political drive is in place to implement a policy,

studies assume a less important role.

Given the arguments for a one-way tolls policy, it is not surprising that I think the policy is long overdue. The issue to consider then is how such projects can be achieved quicker and with minimum political hassle. "Not in Boston" was the common response. Perhaps if the MTA and Massport viewed one-way tolls as an opening for more cooperation on ground access issues they might together anticipate issues in the future and address them more efficiently. Informal discussion among the Boards and/or staff could begin soon on a variety of Logan-related issues. The role of EOTC in making one-way tolls a reality was critical. Its importance in future policy initiatives cannot be overstated. EOTC can serve a critical function to inspire and enable other state agencies to see that they have a shared stake in some issues. EOTC can also provide the necessary support to agencies unwilling to pursue more politically controversial projects that might have impressive long-run results despite short term risks.

One-way tolls can be seen as the foot in the door for operational responses. Perhaps its smooth implementation and the noticeable improvement in traffic flow will serve to stimulate agencies to consider more operational responses and actually have momentum to see them happen. Active interest inside public agencies from the staff and leadership combined with the recognition of the merits of a project to relieve traffic congestion is a solid beginning.

Footnotes: Chapter 3

1. Jeff McMann, "Logan Airport Ground Transportation Alternatives," p. 5.

2. Interview with Brian Day, Traffic Consultant to Massport: Feb. 17, 1983.

3. Jeff MacMann, p. 4.

4. Internal Massport Memorandum.

5. Massport Master Plan Study Team, "Logan Airport Master Plan Study" (Massport: Sept. 1975), p. V-81.

6. Padnos and Selig, "Transportation Controls in Boston: The Plan that Failed" (Boston: 1976).

7. Coverdale and Colpitts, "Report on Logan Airport Travel Study," (New York: 1972) Exhibit L, Sheet 1 of 5.

8. Ibid., Exhibit L, Sheet 2 of 5.

9. Massport Master Plan Study Team (1975), pp. V-17, 18.

10. Boston Transportation Planning Review, p. 54.

11. Boston Transportation Planning Review, p. 48.

12. Massport Master Plan Study Team (1975), pp. V-17.

13. Ibid., pp. V-29.

14. Ibid., pp. V-23.

15. Ibid., pp. V-23.

16. Massachusetts Port Authority, "Master Plan Logan International Airport" (Boston: April 1976), p. 49.

17. "The Logan Airport Dilemma," Taxi Digest, June 1982, p. 2.

18. National Highway Research Program Synthesis of Highway Practice, John J. Roark, "Experiences in Transportation System Management" (Washington, D.C.: Transportation Research Board, Nov. 1981), p. 12.

19. Internal Massport Memorandum.

20. Interview with and information from Mary Ellen Sullivan, Planning Department, Massport: March 14, 1983.

21. Ibid.

22. Ibid.

23. Discussion with Cathy Scanell, Ground Transportation Department, Massport: May 6, 1983.

24. Discussion with Richard DeNeufville, MIT Professor: April 28, 1983.

25. Internal Massport Memorandum.

26. Commissioner Vitagliano, Transportation Research Forum, Cambridge: April 28, 1983.

27. Brian Day, "Reports on the Effects and Feasibility of a One-Way Toll Collection Policy at the Mystic-Tobin Bridge and the Sumner-Callahan Tunnels."

28. Interview with David Chia, graduate student, MIT: April 11, 1983.

29. Fred Pillsbury, "One-Way Tolls Would Reduce Traffic, Revenues, Study Says," Boston Globe, Feb. 8, 1983.

30. John A. Vitagliano, "Speed Tunnel Traffic with One-Way Toll," Boston Globe, June 27, 1982.

31. Fred Pillsbury, Boston Globe, Feb. 8, 1983.

32. Interview with David Chia.

33. Interview with Judith Bernstein, Massport Project Manager, One-Way Tolls Experiment: April 21, 1983.

34. "Round-Trip Tolls Urged to Speed Evening Traffic," Boston Globe, May 18, 1982.

35. Interview with Judith Bernstein.

36. "Aldermen Opposed to One-Way Bridge Tolls," Chelsea Record, Sept. 23, 1983.

Conclusion

Improving ground access to Logan Airport is an ongoing technical problem for the Boston Region. Given the extended time frame as well as the expense of the physical solutions under consideration, this paper examines two short-term operational solutions. The cases of one-way tolls and increased limo usage suggest that political factors exist that must be addressed before operational approaches can be implemented.

The previous chapters have shown how the political postures of state and local agencies have influenced the outcome of these operational responses. Failure to implement a one-way tolls policy in the past has been due to intergovernmental issues. After years of discussion, however, several political factors that were critical to the implementation of the policy are now in place.

First, the one-way tolls policy allows for diffusion of responsibility so that no single agency is accountable for the success or failure of the outcome. It should be noted, however, that the chance of backlash is considerably less when a policy is as non-disruptive, both physically and behaviorally, as this one is. The minimal disruption of one-way tolls is the second reason for its success. There is little construction and construction-related disruption associated with implementation. In addition, the public's travel behavior is, for the most part, left intact. One-way

tolls provides agencies with the opportunity to be seen as taking action on the congestion issue. Policies are more likely to be pursued by agencies when policies can be construed by the public as demonstrating a genuine interest in solving the problem.

Like one-way tolls, increased limo usage is an operationally viable approach to relieve congestion, but political factors have, to date, presented major barriers to its successful implementation. The vocal dissatisfaction of cab drivers has been one major difficulty. Politicians respond to the needs of constituents, particularly when interest groups are vocal, well organized and, as in the case of the cab drivers, strike to attract attention to their case.

Political difficulty often arises when an agency is directly linked to the negative ramifications of a policy decision. In this case, Massport has been consistently linked to the disturbance generated by the cab drivers strike. The unfavorable public reaction the agency received provides little incentive for it to act. A third politically unattractive aspect of a limo policy is the disruptive nature of actions needed to supplement such a policy. To ensure some adequate level of success, parking rates would have to be increased, most probably causing negative public reaction.

What then can be concluded about future solutions to the ground access problem? As has been suggested, operational methods, such as one-way tolls and limo usage, are subject to political pressures. Neither policy quite fits the mandate

of an existing agency nor does either have vocal constituency support. Operational solutions yield few visible benefits but may impose significant costs when they disrupt existing patterns of travel. Although physical projects also have costs and create controversy, their benefits are clear: the public can visually see the project emerging and construction produces jobs, contracts and immediate congestion relief. One might conclude, therefore, that unless an organized vocal constituency exists to support operational solutions, the political rewards for such solutions are minimal.

The two cases examined in this paper suggest that the political process inhibits the implementation of operational responses. The aim of political officials to keep controversy at a minimum can be viewed as desirable or as an objective that works against the process. Lack of movement is evident, for example, in the limo issue where it seems there has been little activity and no coherent strategy since the first three day cab strike in 1977. Some might argue that this reveals the weakness of the political process - that it cannot recover from such a disruptive event. I would argue, however, that so long as there is no direct pressure to confront an issue, the actors in the political process shy away from politically risky issues. This results in many missed opportunities to deal with issues efficiently and effectively.

The parameters of political feasibility, though, can and do change. What may be viewed today by the public as a

disruptive and unacceptable response, may in the future represent a more tolerable imposition compared to the current inconvenience of traveling to Logan during peak hours. Perhaps only when agencies perceive that solving the congestion problem is also an effective way to satisfy a large number of constituent groups will they be prepared to take political risks. In the course of waiting for such changes in the political environment, however, traffic congestion could reach the crisis level. To avoid this, initiatives to cultivate and build support for operational solutions should begin now. The cases display the difficulty of developing support for operational policies across several political institutions. To assist in this process EOTC, the MTA and/or Massport could, for example, create a reasonably high level position such as Director of Traffic Management to be responsible for addressing both the technical and political needs of selected operational responses.

One must of course consider how such a position could become a useful mechanism to promote operational initiatives, given that the poltical process does not appear to encourage "public entrepreneurship." It would be helpful, for example, if EOTC in conjunction with other agencies were to become involved in developing this position. Joint input would aid in future communication. Such a Director could concentrate initially on generating interest inside political institutions, focusing on broad objectives that coincide rather than conflict. That is, to build a consensus on the less contro-

versial aspects of operational solutions. The position must serve to facilitate agency involvement with operational issues, and to minimize political risk, on issues such as the limo policy that have been controversial in the past.

Development of the position requires the commitment of several highly respected top transportation people. As support inside political institutions develops, agencies can work to create public interest in operational measures. Momentum to develop responses to traffic congestion for the next ten years must begin now regardless of the adoption of any larger physical solution. If political issues now hindering the adoption of viable operational measures can begin to be addressed through some formal mechanism, such as a Director of Traffic Management, then the political feasibility of these solutions to the ground access problem would be greatly increased.

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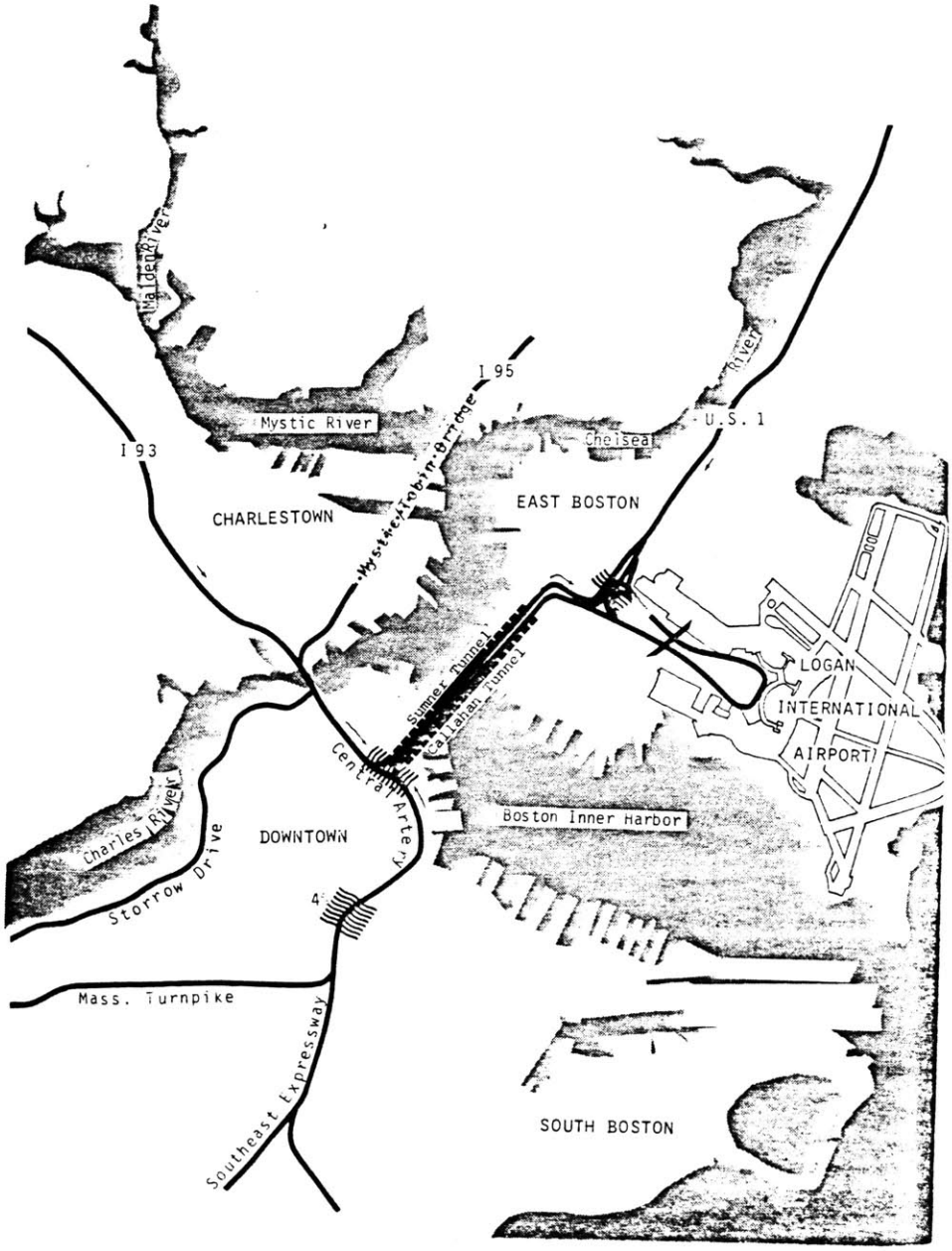
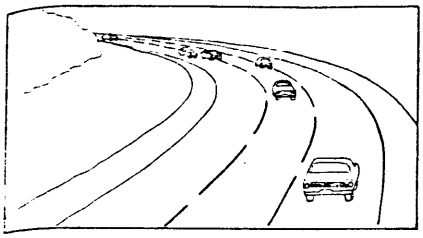
N. Chapman
David Chia
Larry Coleman
Brian Day
Richard DeNeufville
Carolyn DiMambro
Catherine Donaher
Norm Faremelli
Maurice Freedman
Joe Green
Joyce Hall
Ann Hershfang
Tom Lisco
Richard Marchi
Steve Martin
Robert Mellman
Jim Purdy
Cathy Scannell
Peter Scheinfield
Mary Ellen Sullivan
Robert Weinberg
Karen Waite
Jeff Young

Residents in Cambridge, Brookline, Lincoln, Mansfield, East Boston and Boston.

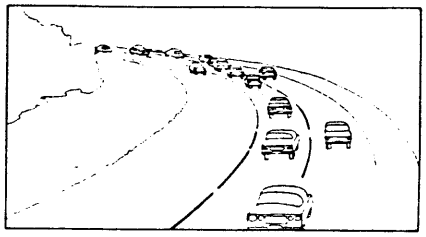
Appendix I


Mystic River
I 95
I 93
CHARLESTOWN
Chelsea
U.S. 1
EAST BOSTON
Mystic-Tobin Bridge
Sumner Tunnel
Callahan Tunnel
LOGAN
INTERNATIONAL
AIRPORT
Central Artery
Boston Inner Harbor
Charles River
DOWNTOWN
Storrow Drive
Mass. Turnpike
Southeast Expressway
SOUTH BOSTON

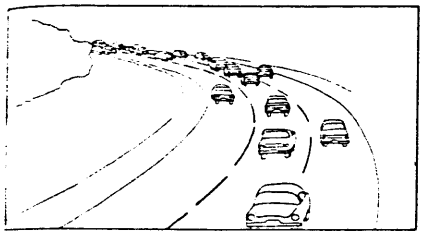
Appendix II



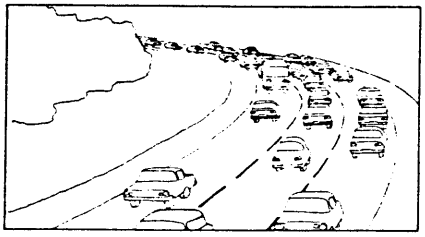
Level of Service A: Traffic is free flowing without physical restrictions on speed or maneuverability.



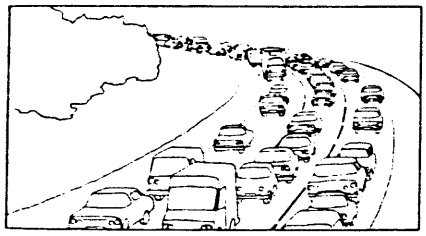
Level of Service B: Traffic moves in a stable flow with slight delays. The driver is reasonably free to choose lane and speed.



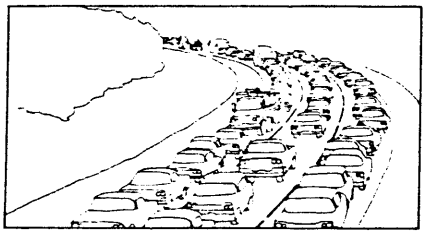
Level of Service C: Traffic volume controls speed and choice of lane, to a degree, but satisfactory movement is still maintained. Moderate delays are experienced.



Level of Service D: Traffic volume affects the maintenance of speed and choice of lane, causing congested, unstable flow.



Level of Service E: Traffic moves in an unstable flow with low speeds, increased congestion, and delays. Traffic volumes are at or near capacity.



Level of Service F: Forced flow conditions (stop and go). Traffic moves at very low speeds, if at all, resulting in significant congestion.

Pictorial Representation of Level of Service

Source: The Transportation Research Board, Washington, D.C.